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C L A I M S

1. A catalyst system for the polymerisation of ethylene, comprising chromium oxide and a metallocene supported on an inorganic support, **characterised** by:

   a) said support being a particulate inorganic oxide;

   b) the chromium of said chromium oxide being in a reduced oxidation state,

and

   c) a metallocene compound having the formula:

$$Cp_2ZrR'R''$$

wherein each Cp, being equal or different, is an unsubstituted or substituted cyclopentadienyl compound, and R' and R", independant of each other, are selected from the group comprising alkyls having 1 to 6 carbon atoms, unsubstituted or substituted benzyl, and phenoxy substituted with alkyls having 1 to 6 carbon atoms, and R' or R" may be a halide.

2. A catalyst system according to claim 1, **characterised** in that the cyclopentadienyl compound is substituted with radicals selected from the group comprising unsubstituted and substituted linear, branched, cyclic or partially cyclic alkyl radicals and annelated cyclic radicals, containing 1 to 20 carbon atoms; unsubstituted and substituted monocyclic or polycyclic aryl radicals which optionally also may contain hetero atoms; and aralkyl radicals; the substituents on the cyclopentadienyl ring may also form annelated structures comprising one or more fused benzene, naphtalene or cyclohexene rings, which optionally may contain hetero atoms, and the two cyclopentadienyl rings may also be connected through a bridge.

3. A catalyst system according to claim 1, **characterised** in that R' and R" are selected from the group comprising chloride, methyl, benzyl or phenoxymethyl, and combinations thereof.

4. A catalyst system according to claims 1 to 3, **characterised** in that Cp is an unsubstituted cyclopentadienyl and that R' and R" are equal and are either methyl or benzyl.

5. A catalyst system according to claims 1 to 4, **characterised** in that the metallocene is bis-cyclopentadienyl-zirconium dibenzyl.

6. A catalyst system according to claim 1, **characterised** in that said support is a particulate, inorganic oxide selected from the group comprising alumina, silica, titania, zirconia, magnesia, and combinations thereof.

7. A catalyst system according to claim 6, **characterised** in that said support is silica having the shape of spherical or spheroidal particles with a particle size in the range of from 20 μm to 150 μm, and a surface area from 200 m^2/g to 600 m^2/g.

8. A catalyst system according to claim 1, **characterised** in that the chromium is present in an amount from 0.1 % to 10 % by weight calculated as metallic chromium based on the weight of the chromium/silica catalyst of a) and b).

9. A catalyst system according to claim 8, **characterised** in that the chromium is present in an amount from 0.5 to 2,0 % by weight of chromium.

10. A catalyst system according to claim 1 to 5, **characterised** by a molar ratio between zirconium and chromium in the final catalyst in the range from 0.1:1 to not higher than 2:1.

11. A catalyst system according to claim 9, **characterised** in that said molar ratio between zirconium and chromium is from 0.5:1 to 1:1.

12. A method for the preparation of the catalyst system of claim 1, comprising the steps of:

a) calcining a support being a particulate, inorganic oxide selected from the group comprising alumina, silica, titania, zirconia, magnesia, and combinations thereof,

b) joining onto the surface of said support a chromium-organic compound to obtain a catalyst precursor,

c) subjecting said catalyst precursor to oxidising conditions to obtain the chromium in an oxidised state,

d) subjecting said catalyst precursor to reducing conditions to obtain a prereduced catalyst,

characterised by

e) reducing the oxidised chromium to obtain the main part thereof in a bivalent oxidation state

f) contacting said reduced catalyst with a metallocene compound having the formula:

$$Cp_2ZrR'R''$$

wherein each Cp, equal or different, is an unsubstituted or substituted cyclopentadienyl compound, and R' and R", independant of each other, are selected from the group comprising alkyls having 1 to 6 carbon atoms, unsubstituted or substituted benzyl, and phenoxy substituted with alkyls having 1 to 6 carbon atoms, and R' or R" may be a halide.